

## PATENT ABSTRACTS OF JAPAN

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(71)Applicant : TOWA ELECTRON KK

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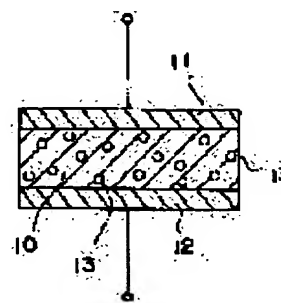
(72)Inventor : NISHI YOSHIHIRO  
KAWAMURA MINORU

## (54) CONDUCTOR-DIELECTRIC-MIXED CAPACITOR

## (57)Abstract:

**PURPOSE:** To provide a conductor-dielectric-mixed capacitor of small equivalent series resistance which has a large dielectric constant and can be miniaturized and increased in capacity, in which the frequency characteristic of a dielectric loss tangent is stable.

**CONSTITUTION:** In the capacitor of a sandwich structure, a dielectric layer 10 is sandwiched between, and bonded by, one pair of lead electrodes 11, 12. In the capacitor, conductor particles 13 in which an insulating film has been formed on the surface are mixed with, and dispersed to, the dielectric layer 10 at high concentration, and the interelectrode distance between the lead electrodes 11, 12 becomes short by the conductor particles 13. As a result, its dielectric constant is increased. The capacitor can be miniaturized, and its capacity can be made large. In addition, its low dielectric loss tangent of a dielectric substance is maintained, and its equivalent series resistance can be reduced.



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CLAIMS

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[Claim(s)]

[Claim 1] the conductor with which the dielectric layer was fastened with the lead electrode of a couple, and the insulating coat was prepared in the front face in the capacitor of formation at said dielectric layer — the conductor with which a particle is characterized by the configuration mixed and distributed, and a dielectric hybrid model capacitor.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application] the conductor which prepared the insulating coat in the front face in order to solve the fault of an electrical order, like the dielectric constant of this invention is small in the capacitor used for various electronic equipment in more detail about a conductor and a dielectric hybrid model capacitor, and the formation of small large capacity is difficult — it is related with the capacitor which makes a dielectric layer mix and come to distribute a particle to high concentration.

[0002]

[Description of the Prior Art] As everyone knows, a capacitor has various capacitors according to the class of the dielectric. However, all have the advantage and demerit, although a dielectric constant is large, the temperature characteristic is bad, and the ideal capacitor is not realized as a dielectric constant is small, although the temperature characteristic is good for reverse. For this reason, the actual condition is that the user uses the capacitor properly according to an application. By the way, in the conventional capacitor, the dielectric layer 1 which formed various insulating materials by various approaches has structure of the sandwiches form by which \*\* arrival was carried out with the lead electrodes 2 and 3 of a couple as is shown in drawing 2 as the principle drawing.

[0003]

[Problem(s) to be Solved by the Invention] However, by the conventional capacitor, since the engine performance of a capacitor was decided by the physical properties of the dielectric of formation of a dielectric layer and there were the advantage and demerit according to the class of dielectric, invention of a near capacitor was demanded by the application by the capacitor with proper use ideal required therefore.

[0004] The place which it was made that this invention should answer such a request, and is made into the object has a large dielectric constant, and the formation of small large capacity is possible for it, and its frequency characteristics of a dielectric dissipation factor are stable, and it is to offer the small conductor of equivalent series resistance, and a dielectric hybrid model capacitor.

[0005]

[Means for Solving the Problem] the conductor with which, as for this invention, \*\* arrival of the dielectric layer was carried out with the lead electrode of a couple, and the insulating coat was prepared in the front face in the capacitor of formation at said dielectric layer for this object — a particle is mixed and distributed and it is preferably characterized by the configuration mixed and distributed by high concentration.

[0006]

[Example] An example is explained with the operation with reference to a drawing. the conductor with which drawing 1 is principle drawing in an example of the capacitor concerning this invention, and, as for a dielectric layer, the lead electrode of a couple with which ten carry out 11 among drawing and 12 are carrying out \*\* arrival of the dielectric layer, and 13, the insulating coat was prepared in the front face — a particle (the following — only — a conductor — it is called a particle 13) is shown. this invention capacitor — the inside of a dielectric layer 10 — a conductor — a particle 13 makes the summary the principle configuration mixed and distributed. a conductor — the metal particles which make insulating oxides, such as aluminum, Ta, Ti, nickel, Cu, and Fe, as an approach of preparing an insulating coat on the surface of a particle — the inside of atmospheric air or O<sub>2</sub> ambient atmosphere — inorganic, such as ordinary temperature or the approach of heating and making an insulating oxide film and SiC ] — the approach of making carry out scaling of the conductor similarly, and making the insulator layer of SiO<sub>2</sub> grade, or a conductor — it is carried out by either of the approaches of applying SiO<sub>2</sub>, an insulating coating, etc. on a particle, and making an insulator layer. this conductor — the mixed distribution to the dielectric layer 10 of a particle 13 a non-hardened dielectric layer and the conductors to cut, such as thermosetting resin,, after mixing a particle the mixed hardening method to stiffen and this conductor — the mixed rolling-out method for rolling out what mixed the dielectric layer with the particle — the chemical vacuum deposition (BURAZUMA polymerization) which vapor-deposits in the plasma state what carried out heating evaporation of a conductor and the dielectric in O<sub>2</sub> partial-pressure ambient atmosphere, and forms a mixed dielectric film — law — Or heating evaporation of a conductor and the dielectric is carried out in a high vacuum with O<sub>2</sub> partial pressure. the vacuum deposition (simultaneous 2 yuan vacuum evaporatio) which condenses the steam and forms a mixed dielectric film — the ultra-fine particle and dielectric ultrafine particle which formed the oxide film in the low vacuum with O<sub>2</sub> partial pressure of law are mixed, and it is carried out by one approach of the approaches of producing a film.

[0007] Furthermore, when explained, 0.2g of things which are in an apparent volume ratio and mixed the aluminium

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powder in which a polyether amide and the natural oxidation film were formed, to 1:8-9 was inserted with the stainless plate of 20mmphi, the application of pressure of about 140 kgf(s) was applied, and electrostatic capacity was measured. Consequently, compared with the dielectric constant of a polyether amide simple substance, the dielectric constant increased by about 34 times. Moreover, the dielectric dissipation factor was the 0.02 [ same ] as a polyether amide simple substance, and was almost stable to the frequency of 100Hz - 10MHz. Furthermore, equivalent series resistance decreased to the abbreviation 1/10 of a polyether amide simple substance.

[0008] thus, the inside of a dielectric layer 10 — a conductor — if a particle 13 is mixed and distributed — this — a conductor — a particle 13 commits an electrode, the lead electrode 11 and the electrode distance between 12 become short, and a dielectric constant increases.

[0009]

[Effect of the Invention] the conductor which carried out the deer, and was mixed and distributed by the dielectric layer according to this invention — as a result of a particle's serving to shorten inter-electrode distance of a lead electrode, the dielectric constant increased and small large capacity-ization of a capacitor was attained. Moreover, the low dielectric dissipation factor of a dielectric simple substance is maintained, and equivalent series resistance was also able to be decreased.

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TECHNICAL FIELD

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[Industrial Application] the conductor which prepared the insulating coat in the front face in order to solve the fault of an electrical order, like the dielectric constant of this invention is small in the capacitor used for various electronic equipment in more detail about a conductor and a dielectric hybrid model capacitor, and the formation of small large capacity is difficult — it is related with the capacitor which makes a dielectric layer mix and come to distribute a particle to high concentration.

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PRIOR ART

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EFFECT OF THE INVENTION

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[Effect of the Invention] the conductor which carried out the deer, and was mixed and distributed by the dielectric layer according to this invention — as a result of a particle's serving to shorten inter-electrode distance of a lead electrode, the dielectric constant increased and small large capacity-ization of a capacitor was attained. Moreover, the low dielectric dissipation factor of a dielectric simple substance is maintained, and equivalent series resistance was also able to be decreased.

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**TECHNICAL PROBLEM**

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[Problem(s) to be Solved by the Invention] However, by the conventional capacitor, since the engine performance of a capacitor was decided by the physical properties of the dielectric of formation of a dielectric layer and there were the advantage and demerit according to the class of dielectric, invention of a near capacitor was demanded by the application by the capacitor with proper use ideal required therefore.

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MEANS

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EXAMPLE

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[0007] Furthermore, when explained, 0.2g of things which are in an apparent volume ratio and mixed the aluminium powder in which a polyether amide and the natural oxidation film were formed, to 1:8-9 was inserted with the stainless plate of 20mmphi, the application of pressure of about 140 kgf(s) was applied, and electrostatic capacity was measured. Consequently, compared with the dielectric constant of a polyether amide simple substance, the dielectric constant increased by about 34 times. Moreover, the dielectric dissipation factor was the 0.02 [ same ] as a polyether amide simple substance, and was almost stable to the frequency of 100Hz - 10MHz. Furthermore, equivalent series resistance decreased to the abbreviation 1/10 of a polyether amide simple substance.

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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is a principle explanatory view in an example of the capacitor concerning this invention.

[Drawing 2] It is the principle explanatory view of the conventional example.

[Description of Notations]

10 Dielectric Layer

11 12 Lead electrode

13 Conductor Which Prepared Insulating Coat in Front Face — Particle

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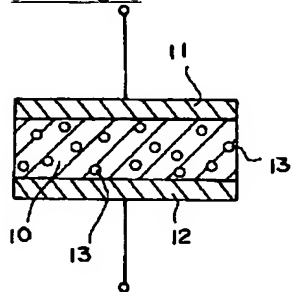
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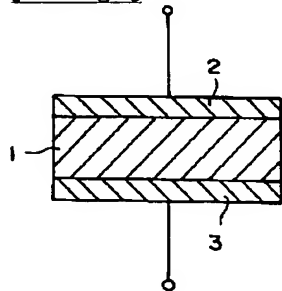
DRAWINGS

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[Drawing 1]



[Drawing 2]



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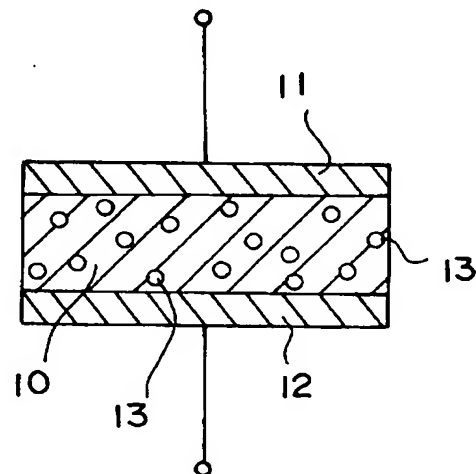
(74) 代理人 弁理士 笹沢 和夫

(54) 【発明の名称】 導体、誘電体混合型コンデンサ

(57) 【要約】

【目的】 誘電率が大きくて小型大容量化が可能で、また誘電正接の周波数特性が安定であって、等価直列抵抗の小さい導体、誘電体混合型コンデンサを提供すること。

【構成】 誘電体層10が一对のリード電極11、12で挟着されたサンドイッチ構造のコンデンサにおいて、前記誘電体層10に、表面に絶縁皮膜が設けられた導体粒子13が高濃度に混合、分散され、該導体粒子13によりリード電極11、12の電極間の距離が短くなった結果、誘電率が増加し、コンデンサの小型大容量化が可能となり、また誘電体単体の低い誘電正接が維持され、等価直列抵抗も減少させることができた。



## 【特許請求の範囲】

【請求項 1】 誘電体層が一对のリード電極で挟着されて形成のコンデンサにおいて、前記誘電体層に、表面に絶縁皮膜が設けられた導体粒子が混合、分散された構成を特徴とする導体、誘電体混合型コンデンサ。

## 【発明の詳細な説明】

## 【0001】

【産業上の利用分野】本発明は、導体、誘電体混合型コンデンサに関し、更に詳しくは、各種電子機器に使用するコンデンサにおいて、誘電率が小さく、小型大容量化が難しい等の電気的性能の欠点を解決するため、表面に絶縁皮膜を設けた導体粒子を誘電体層に高濃度に混合、分散させてなるコンデンサに関するものである。

## 【0002】

【従来の技術】周知のように、コンデンサはその誘電体の種類により各種コンデンサがある。しかし、いずれも長所、短所があり、誘電率は大きい温度特性が悪く、また逆に温度特性は良いが誘電率が小さいというように理想的なコンデンサは実現していない。このためユーザーは用途に応じてコンデンサを使い分けしているのが現状である。ところで、従来のコンデンサは、その原理図としての図 2 に示されているように、各種絶縁物を種々の方法で形成した誘電体層 1 が、一对のリード電極 2、3 で挟着されたサンドイッチ形の構造となっている。

## 【0003】

【発明が解決しようとする問題点】しかしながら、従来のコンデンサでは、誘電体層を形成の誘電体の物性によりコンデンサの性能が決まってしまう、誘電体の種類により長所、短所があるため、用途により使い分けが必要で、そのため理想的なコンデンサにより近いコンデンサの案出が要請されていた。

【0004】本発明は、このような要請に応答すべくなされたもので、その目的とするところは、誘電率が大きくて小型大容量化が可能で、また誘電正接の周波数特性が安定で、等価直列抵抗の小さい導体、誘電体混合型コンデンサを提供することにある。

## 【0005】

【問題点を解決するための手段】この目的のため、本発明は、誘電体層が一对のリード電極で挟着されて形成のコンデンサにおいて、前記誘電体層に、表面に絶縁皮膜が設けられた導体粒子が混合、分散され、好ましくは、高濃度で混合、分散された構成を特徴とするものである。

## 【0006】

【実施例】実施例について図面を参照し、その作用と共に説明する。図 1 は本発明に係るコンデンサの一例での原理図であって、図中、10 は誘電体層、11、12 は誘電体層を挟着している一对のリード電極、13 は表面に絶縁皮膜が設けられた導体粒子（以下、単に導体粒子 13 という）を示す。本発明コンデンサは、誘電体層 1

0 中に導体粒子 13 が混合、分散せられた原理構成をその要旨とする。導体粒子の表面に絶縁皮膜を設ける方法としては Al、Ta、Ti、Ni、Cu、Fe 等の絶縁性酸化物を作る金属粒子を大気中または O<sub>2</sub> 雰囲気中で常温または加熱して絶縁性の酸化皮膜を作る方法、SiC 等の無機導体を同じく表面酸化させて SiO<sub>2</sub> 等の絶縁膜を作る方法または導体粒子上に SiO<sub>2</sub>、絶縁性塗料等を塗布して絶縁膜を作る方法のいずれかによって行われる。かかる導体粒子 13 の誘電体層 10 への混合分散は、熱硬化性樹脂等の未硬化の誘電体層とかかる導体粒子を混合した後、硬化させる混合硬化法、かかる導体粒子と誘電体層を混合したものを圧延する混合圧延法、導体と誘電体を O<sub>2</sub> 分圧雰囲気中で加熱蒸発させたものをプラズマ状態において蒸着し、混合誘電体膜を形成する化学蒸着（プラズマ重合）法または、O<sub>2</sub> 分圧をもって高真空中で導体と誘電体を加熱蒸発させ、その蒸気を凝集して混合誘電体膜を形成する真空蒸着（二元同時蒸着）法の O<sub>2</sub> 分圧をもった低真空中で酸化皮膜を形成した金属超微粒子と誘電体超微粒子を混合し、製膜する方法のいずれかの方法によって行われる。

【0007】更に説明すると、ポリエーテルアミドと自然酸化膜を形成したアルミニウム粉末を見かけの容積比で 1 : 8 ~ 9 に混合したもの 0.2 g を 20 mm φ のステンレス板で挟み、約 140 kgf の加圧を加え、静電容量を測定した。その結果、ポリエーテルアミド単体の誘電率に比べ約 3.4 倍に誘電率が増加した。また、誘電正接はポリエーテルアミド単体と同じ 0.02 で、周波数 100 Hz ~ 10 MHz までほぼ安定であった。更に等価直列抵抗はポリエーテルアミド単体の約 1/10 に減少した。

【0008】このように、誘電体層 10 中に導体粒子 13 が混合、分散されると、該導体粒子 13 が電極の働きをし、リード電極 11、12 間の電極距離が短くなり、誘電率が増加する。

## 【0009】

【発明の効果】しかして、本発明によれば、誘電体層に混合、分散された導体粒子がリード電極の電極間距離を短くする働きをする結果、誘電率が増加し、コンデンサの小型大容量化が可能となった。また誘電体単体の低い誘電正接が維持され、等価直列抵抗も減少させることができた。

## 【図面の簡単な説明】

【図 1】本発明に係るコンデンサの一例での原理説明図である。

【図 2】従来例の原理説明図である。

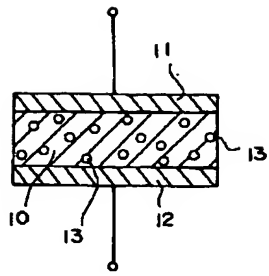
## 【符号の説明】

10 誘電体層

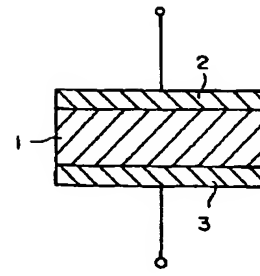
11、12 リード電極

13 表面に絶縁皮膜を設けた導体粒子

【図1】



【図2】



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